

is to be issued after written examination or on the basis of endorsement of credentials or reciprocity. Connecticut and Wisconsin, in 1925, were the first states to enact laws. The most recent addition to the list, and the only new one added in 1941, was New Mexico. While the Basic Science laws in some states include reciprocal agreements, the certificate is obtainable only after examination in the majority of instances. . . .

"In 1941 Basic Science boards were in operation in Arizona, Arkansas, Colorado, Connecticut, the District of Columbia, Florida, Iowa, Michigan, Minnesota, Nebraska, New Mexico, Oklahoma, Oregon, Rhode Island, South Dakota, Washington and Wisconsin. . . .

"There were 2,148 candidates in the various groups examined last year by the seventeen boards named. Of this number 1,768 were doctors of medicine or medical students, 151 osteopaths, 16 chiropractors, and 189 were placed in the unclassified group. Of all applicants examined, 1,751 passed and 397, 18.5 per cent, failed. Of the physicians examined 11.8 per cent failed; osteopaths 36.4 per cent, chiropractors 68.8 per cent and unclassified 52.4 per cent. Among those who passed there were 1,560 physicians, 96 osteopaths, 5 chiropractors and 90 who were unclassified. Ten doctors of dentistry passed but none of the naturopaths. Iowa examined the greatest number, 295, of whom 35.6 per cent failed. The next largest number, 264, were examined in Minnesota, with 18.9 per cent failures. One other state examined more than 200, Florida, of whom 13.0 per cent failed."

EDITORIAL COMMENT†

SAPROPHYTIC ANTITOXINS

An entirely new field of practical therapeutic research is initiated by Neter's¹ current demonstration that certain enzymes, isolated from saprophytic bacteria, are able to neutralize or destroy toxins formed or secreted by virulent pyogenic cocci.

Antagonism between pathogens and environmental saprophytes has been of research interest for many years.² Fleming,³ for example, obtained a substance from *Penicillium notatum* ("penicillin"), which is markedly antagonistic to pyogenic cocci and diphtheria bacilli. Since this substance is not antagonistic to *B. influenzae*, the substance has been used as an aid in the isolation of this organism. Somewhat later Waksman⁴ isolated two similar bacteriostatic agents ("acti-

nomycins A and B") from *Actinomyces anti-bioticus*. Of greater clinical interest, however, are "gramicidin" and "tyrocidin," recently isolated by Dubos⁵ from *Bacillus brevis*. Gramicidin acts solely upon gram-positive bacteria, while tyrocidin is also bactericidal or bacteriostatic for gram-negative bacteria. A mixture of these two substances is at present commercially available under the trade name, "tyrothricin."

The latest addition to this rapidly-growing list of saprophytic antiseptics is "streptothricin," recently isolated by Waksman⁶ from certain soil *Actinomyces*. In contrast with most of the earlier saprophytic products, Streptothricin is primarily active against gram-negative bacteria (e.g., *B. coli*). Since it is active in the presence of agar, it is of promise in the preparation of differential culture media.

In view of the successful isolation of antibiotic agents from environmental saprophytes, the question arises as to whether or not some of these agents may not also act upon cell-free bacterial toxins. In order to test this possibility, Neter selected two toxin-like products: (a) the anti-human fibrinolysin, secreted by virulent strains of hemolytic streptococci, and (b) the coagulase formed by certain highly virulent staphylococci. Both of these fractional toxins were tested against tyrothricin and actinomycin A. In a typical test, constant amounts of cell-free fibrinolysin were mixed with increasing amounts of tyrothricin, and the resulting mixtures tested for their lytic action on human plasma clots, by the technique of Tillett and Garner.⁷ In test tubes containing 0.001 mg. or more tyrothricin, the arbitrary dose of fibrinolysin was completely neutralized or destroyed. Similar quantitative neutralization was noted in the presence of 0.0005 mg. actinomycin A. In similar tests with staphylococcus coagulase, neutralization was also complete with 0.001 mg. tyrothricin or 0.005 mg. actinomycin A.

Since fibrinolysin and coagulase play important rôles in the pathogenesis of streptococcal and staphylococcal infections, the two saprophytic products, tyrothricin and actinomycin A, can be conveniently classified as fractional antitoxins. Whether or not these microbic antitoxins are active in the animal body, has not yet been determined.

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† This department of CALIFORNIA AND WESTERN MEDICINE presents editorial comments by contributing members on items of medical progress, science and practice, and on topics from recent medical books or journals. An invitation is extended to all members of the California Medical Association to submit brief editorial discussions suitable for publication in this department. No presentation should be over five hundred words in length.